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EXAMINER	
STINSON, FRANKIE L	

ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/650,393	MITSUMORI ET AL.	
	Examiner	Art Unit	
	/FRANKIE L. STINSON/	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-19 and 27-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-19 and 27-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. The indicated allowability of claims 16-19, 27-32 and 35 is withdrawn in view of the newly discovered reference(s) to Japan'040, Firestone and Japan'132. Rejections based on the newly cited reference(s) follow.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 16-19 and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japan'132 (Japan 62-122132) in view of Japan'040 (Japan 57-3040), Firestone (U. S. Pat Nos. 2,398,701 & 2,625,035) or Wood (U. S. Pat. No 3,237,445).

Re claim 27, Japan'132 is cited disclosing a wet treatment nozzle comprising:

an ultrasonic cleaner comprising, an ultrasonic transducer (13);

an introduction passage (15) for introducing a treatment liquid on an exterior side of the ultrasonic cleaner;

an exhaust passage (16) which exhausts the treatment liquid on an other exterior side of the ultrasonic cleaner after a wet treatment of an object to be treated, the exhaust passage exhausting the treatment liquid that wet treated the object;

wherein the ultrasonic cleaner includes a flow path along the housing between the introduction passage and the exhaust passage that guides the treatment liquid to wet treat the object to be treated, such that the treatment liquid is exposed to atmosphere between the housing and the object to be treated, and

a pressure controller (inherent) operable to maintain a difference between a pressure of the treatment liquid in contact with the object to be treated and an atmospheric pressure, so that the treatment liquid in contact with the object does not flow to the outside of the flow path, that differs from the claim only in the recitation of the housing the weight, wherein the weight minimizes propagation of energy from the ultrasonic transducer to a wall of the housing by shifting the characteristic frequency of the wall of the housing. With respect to the housing, the patents to Japan'040 (as at 7), Firestone'701 (unnumbered, see fig. 6), Firestone' 035 (as at 52) and Wood (as at 4) are each cited disclosing the housing as claimed. It therefore would have been obvious to one having ordinary skill in the art to modify the arrangement of Japan'132, to include a housing as taught by Japan'040, Firestone or Wood, for the purpose of providing a protective arrangement. It is common in the art to encase components of devices to prevent damage or injury. With respect to the weight, Japan'040 (unnumbered component which carries component 7), Firestone'701 (see page 2, right col., lines 26-36), Firestone' 035 (as at 56) and Wood (as at 2, col. 2, lines 31-34), are each cited disclosing a weight (Bakelite), wherein the weight minimizes propagation of energy from the ultrasonic transducer to a wall of the housing. It therefore would have been obvious to one having ordinary skill in the art to modify the arrangement of Japan'132, to include a weight as taught by Japan'040, Firestone or Wood, for the purpose of ensuring efficient transfer of the wave energy. It is old and well known in the art to employ structures such as weights, material thicknesses, grooves and shape of sonic transducers to enhance/control wave energy as well as for cancelling interfering

waves/frequencies, as needed or as desired. It should also be noted that it is the examiner's position that given Japan'132 is a "local" (spot) cleaner (see attached translation) where only specific areas/regions are to be cleaned, and with the introduction and exhaust fluid passages, the creation of the meniscus (19) as show in fig. 3, is obviously pressure controlled, or the meniscus would not exist. Too much positive pressure and the fluid would flow to areas outside the local cleaning spot, too great a negative/exhaust pressure, and the liquid would immediately be exhausted from the local cleaning spot and the cleaning would be ineffective. A balance of introduction and exhaustive pressures obviously exist and the same is of specific design and not a random occurrence. Re claim 28, Japan'132 discloses the u-shape. Re claim 29, the shifting frequency is deemed to be inherent in the Japan'132 as proposedly modified. Also note the following:

APPARATUS CLAIMS MUST BE STRUCTURALLY DISTINGUISHABLE FROM THE PRIOR ART

>While features of an apparatus may be recited either structurally or functionally, claims<directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. >In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429,1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to
function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also In re Swinehart, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). " [A]pparatus claims cover what a device is, not what a device does." Hewlett-Packard Co. v. Bausch &

Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART

A claim containing a " recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (The preamble of claim
1 recited that the apparatus was " for mixing flowing developer material" and the body of the claim recited " means for mixing ..., said mixing means being stationary and completely submerged in the developer material" . The claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer. However, the mixer was only partially submerged in the developer material. The Board held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected.).

Re claim 30, Japan'132 discloses the flow path as claimed. Re claim 31, Japan'132 discloses the fresh treatment liquid. Also see "MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART" as noted above. Re claim 32, Japan'132 discloses the weight as ring shaped. To locate the same around the housing is deemed to be a mere rearrangement of parts (see MPEP 2144.04 REVERSAL, DUPLICATION OR RE-ARRANGEMENT OF PARTS). This is also applicable to the subject matter of claims 16-19.

4. Claims 33, 34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japan'040.

Re claim 33, Japan'040 is cited disclosing is cited disclosing all of the claimed subject particularly a wet treatment nozzle comprising:

an ultrasonic cleaner (inherent) comprising a housing (7), an ultrasonic transducer (15) placed on a bottom surface of the housing and a weight (unnumbered part beneath 7) on the housing;

an introduction passage (11) associated with a first frame member, the introduction passage configured to introduce a treatment liquid on a first side of the ultrasonic cleaner; and

an exhaust passage (12) associated with a second frame member, the exhaust passage configured to exhaust the treatment liquid on a second side of the ultrasonic cleaner after a wet treatment of an object to be treated,

wherein the ultrasonic cleaner, while vibrating, is configured to guide the treatment liquid along a bottom surface of the housing to wet treat the object, and

wherein the weight is configured to minimize propagation of energy from the ultrasonic transducer to the housing and to the frame members by shifting the characteristic frequency of the housing (inherent in Bakelite) that differs from the claim only in the recitation of the weight separating the first and second s frame member from the housing. Nonetheless, to locate the weight as claimed is deemed to be a mere rearrangement of parts (see MPEP 2144.04 REVERSAL, DUPLICATION OR RE-ARRANGEMENT OF PARTS). It is old and well known in the art to employ, sometime in

even in combination, weights, material thicknesses, grooves and shape of sonic transducers to enhance/control wave energy, as well as for cancelling interfering waves/frequencies, as needed or as desired. It is also known, to locate the arrangements in various positions/locations to achieve the desire results. Re claim 34, Japan'040 discloses the flow path. Re claim 36, Japan'040 discloses the ring shape.

5. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Japan'040 in view of either Japan'132 of Kauffeldt et al. (U. S. Pat. No. 4,756,048).

5. Claim 35 defines over Japan'040 only in the recitation of the controlled pressure. Japan'132, as discussed previously, and Kauffeldt (col. 5, lines 5-32) discloses the controller pressure as claimed. It therefore would have been obvious to one having ordinary skill in the art to modify the arrangement of Japan'040, to employ controlled pressure as taught by either Japan'132 or Kauffeldt, for the purpose of precisely controlling the application and withdrawal of liquid.

6. Applicant's arguments with respect to the pending claims and/or the rejection thereof have been considered. The arguments and/or amendments with respect to the claims have been effective in defining over previous Office Action, however, the current remarks stand moot in view of the new ground(s) of rejection.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In Japan'523, Japan'991, Sofen, Germany'486, note the introduction and exhaust passages.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRANKIE L. STINSON whose telephone number is

(571) 272-1308. The examiner can normally be reached on M-F from 5:30 am to 2:00 pm and some Saturdays from approximately 5:30 am to 11:30 am.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached on (571) 272-1700. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

fls

/FRANKIE L. STINSON/
Primary Examiner, Art Unit 1792

TRANSLATION

PTO 08-3058

CC = JP
19870603
Kokai
62122132

ULTRASONIC CLEANING DEVICE

[Chouonpa wo mochiita senjou souchi]

Genkuro Matsuyama

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. MARCH 2008
TRANSLATED BY: THE MCELROY TRANSLATION COMPANY

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APPLICATION DATE	(22):	19851120
INTERNATIONAL CLASSIFICATION[4]	(51):	H 01 L 21/304
		B 08 B 3/12
INVENTOR	(72):	Geshiro Matsuyama
APPLICANT	(71):	Sharp Corp.
TITLE	(54):	ULTRASONIC CLEANING DEVICE
FOREIGN TITLE	[54A]:	Chouonpa wo mochiita senjou souchi

Claim

An ultrasonic cleaning device characterized in that it is a cleaning means that cleans surface areas in which a surface area detection means, a means for detecting surface areas on an object being cleaned where cleaning is insufficient, has detected that cleaning is insufficient, and by being a cleaning means that includes an ultrasonic wave generating means that possesses an emitter tip that emits ultrasonic waves, and a supply nozzle that supplies an ultrasonic wave transmitting fluid and a suction nozzle that sucks up the ultrasonic wave transmitting fluid, which variously open in the vicinity of the aforementioned emitter tip, and by including a transport means that feeds the object being cleaned toward the cleaning means based on the output from the aforementioned surface area detection means.

Detailed explanation of the invention

Technical field

This invention pertains to devices that use ultrasonic waves to clean substrates in the manufacture of, e.g., silicon Si substrates that are used in, e.g., semiconductor devices.

Technical background

For example, when manufacturing large-scale integrated circuits (LSI), etc., a monocrystalline silicon is manufactured, and then its surface is cleaned. Since the thin film circuits that will be formed on the substrate have intricate structures on the order of several μm, it is necessary that this cleaning be accomplished through high-precision cleaning. Therefore, before performing processing, such as forming thin films on the substrate, etc., the cleaned substrate is commonly inspected to see whether cleaning is complete. This inspection comprises inspecting for, e.g., oils or debris, etc., or checking for the presence

of dust in the cleaning solution. This inspection is generally performed by shining laser light on the substrate and detecting scattering of the laser light in insufficiently cleaned areas.

Problems to be solved by the invention

In the substrate cleaning technology of the prior art, like that described above, after an insufficiently cleaned area has been detected on the substrate surface, the entire substrate must be cleaned again. Consequently, the cleaning process becomes complicated. Additionally, it is necessary to inspect the cleanliness of the whole substrate again when it has thus been entirely rewashed. There is also a danger that new contaminants will adhere to the rewashed substrate if the cleanliness of the cleaning process is not adequately managed.

The objective of this invention is to solve the problems described above, and to provide an improved ultrasonic cleaning device that can locally clean these insufficiently clean areas if insufficiently clean areas are found when inspecting the cleanliness of a substrate.

Means to solve the problems

This invention is an ultrasonic cleaning device that is characterized in that it is a cleaning means that cleans surface areas in which a surface area detection means, a means for detecting surface areas on an object being cleaned where cleaning is insufficient, has detected that cleaning is insufficient, and by being a cleaning means that includes an ultrasonic wave generating means that possesses an emitter tip that emits ultrasonic waves, and a supply nozzle that supplies an ultrasonic wave transmitting fluid and a suction nozzle that sucks up the ultrasonic wave transmitting fluid, which variously open in the vicinity of the aforementioned emitter tip, and by including a transport means that feeds the object being cleaned toward the cleaning means based on the output from the aforementioned surface area detection means.

Operation

With the cleaning device of this invention, inadequately cleaned areas on the object being cleaned are detected by a surface area detection means. When an inadequately cleaned surface area is detected on the objected being cleaned, the transport means feeds the object being cleaned toward the cleaning means based on a signal from the surface area detection means. The cleaning means cleans the aforementioned inadequately cleaned surface area on the object being cleaned by emitting ultrasonic waves from the ultrasonic wave generating means. Prior to this ultrasonic cleaning, ultrasonic wave transmitting fluid is supplied from a supply nozzle that opens in the vicinity of the emitter tip of the aforementioned ultrasonic wave generating means, which emits ultrasonic waves, filling the space between the aforementioned emitter tip and the aforementioned inadequately cleaned surface area of the object being cleaned. Ultrasonic waves from the aforementioned emitter tip are propagated through this ultrasonic wave transmitting fluid to reach the object being cleaned and effect cleaning.

Next, a suction nozzle that opens in the vicinity of the aforementioned emitter tip sucks up the ultrasonic wave transmitting fluid containing dirt, etc. that has been removed from the object being cleaned. Thus, when an inadequately cleaned surface area has been detected on the object being cleaned, local cleaning can be performed for only the vicinity of this surface area. Consequently, there is no need to rewash the entire object being cleaned each time an inadequately cleaned surface area is detected on the object being cleaned, considerably simplifying the cleaning process.

Application example

Figure 1 is a block diagram that shows the structure of a cleaning device 1 in an application example of this invention. The cleaning device 1 is arranged on a base 2, and includes an X table that can be displaced in the left-right direction in Figure 1 and an X-Y table that is disposed on top of the X table and can be

displaced in the X direction (the left-right direction in Figure 1) and the Y direction (the direction perpendicular to the page in Figure 1). The object being cleaned, e.g., a semiconductor substrate 5, is placed on the X-Y table 4.

After the semiconductor substrate 5 has been cleaned, it is washed, e.g., with a variety of acids and then irradiated with laser light from a laser light oscillator 6 to detect whether this cleaning has been adequate, and scattering of the aforementioned laser light from the cleaning defects, which are inadequately cleaned surface areas, is detected by a scattered light detection means 7. The signal from the scattered light detection means 7 is provided to an anomaly sensor 8, and when the anomaly sensor 8 detects a cleaning defect on the semiconductor substrate 5, i.e., when scattered light, in which laser light from the laser light oscillator 6 has been scattered, enters the scattered light detection means 7, first, a signal is sent to the X-Y table driver 11 to stop movement of the X-Y table 4, and then the X table 3 is controlled by an X-table driver 9 and moved to the position shown by the dash-dot-dot line in Figure 1.

The cleaning defect on the semiconductor substrate 5 on the X-Y table 4, which has reached the desired position, is moved by the X table driver 9 only in a straight line from the position at which it was stopped when the aforementioned scattered light was detected, and this movement amount $l1$ can be preset with high precision as the distance between the scattered light detection means 7 and the cleaning device chassis 10. Consequently, the aforementioned cleaning defect is moved so that it is positioned directly beneath the cleaning device chassis 10, which is the cleaning means, without requiring an adjustment operation. This movement is performed by the X-Y table driver 11. The cleaning device chassis 10 uses ultrasonic waves to perform cleaning, as described below, which ultrasonic waves are emitted to the cleaning defect on the aforementioned semiconductor substrate 5 through the cleaning device chassis 10 by converting an electrical signal from a driver 12 into ultrasonic vibration by an ultrasonic oscillator 13. The aforementioned ultrasonic oscillator 13 is constituted from, e.g., a piezoelectric element, etc.

Figure 2 is a drawing showing the structures associated with the cleaning device chassis 10 in Figure 1. The aforementioned cleaning device chassis 10 includes an ultrasonic wave transmission member 14, a supply nozzle 15 for ultrasonic wave transmitting fluid, and a suction nozzle 16 that sucks up ultrasonic wave transmitting fluid that has been supplied from the supply nozzle 15. The ultrasonic wave transmitting member 14 is constituted of a right cylinder part 14a, a reverse truncated cone part 14b, an indentation 14c formed at the tip of the reverse truncated cone 14b (the lower end in Figure 2) all formed into a single unit.

Figure 3 is a block diagram to explain the process by which the semiconductor substrate 5 uses the cleaning device 1 in Figure 1. The cleaning operation in this embodiment will be described referring to Figures 1-3. When a cleaning defect is detected on the semiconductor substrate 5 using the laser light oscillator 6, as described above, the semiconductor substrate 5, which has been placed on the X table 3 and X-Y table 4, is fed toward the cleaning device chassis 10, as described above. At this time, cleaning defect 17 on the semiconductor substrate 5 is moved so that it is positioned directly beneath the indentation 14c formed in the ultrasonic wave transmission member 4.

Next, an ultrasonic wave transmitting fluid, e.g., water, is supplied from the supply nozzle 15, filling the space between the aforementioned indentation 14c and the cleaning defect 17 on the semiconductor substrate. A control layer 18 is formed at the aforementioned indentation 14c, and functions to focus ultrasonic waves on the cleaning defect 17 so that the ultrasonic waves generated are efficiently radiated to the cleaning defect 17.

Next, the driver 12 generates an electrical signal, and the ultrasonic oscillator 13 converts this electrical signal to mechanical vibration, which vibration is transferred in the direction of arrows A1 through the ultrasonic wave transmission member 14, and then propagated via the indentation 14c and control layer 18 inside the ultrasonic wave transmitting fluid 19 and emitted in the direction of arrows A2 to the cleaning

defect 17. Oil or the like adhered in the cleaning defect 17 is broken down by the ultrasonic vibration and removed.

Next, the ultrasonic wave transmitting fluid 19 containing the broken-down oil, etc. is sucked up by the suction nozzle 16 and removed from the surface of the semiconductor substrate 5. The semiconductor substrate 5, with the contamination removed from the cleaning defect 17, is then returned toward the left in Figure 1, and a new inspection for cleaning defects is started using the laser light oscillator 6. Inspection of the areas already inspected up to the detection of the aforementioned cleaning defect 17 can be omitted from the new inspection. Namely, since cleaning can be performed for only the vicinity of the cleaning defect 17 where contamination was detected, without the total rewashing noted in the prior art, this cleaning defect 17 can be inspected to see whether the, e.g., oils, etc. have been completely removed, and if there are still areas that have not yet been inspected, inspection can be continued for those areas. Consequently, the semiconductor substrate 5 cleaning process can be considerably simplified.

Effect of the invention

According to this invention, as described above, if an inadequately cleaned area is detected on the object being cleaned, ultrasonic wave transmitting fluid is supplied from a supply nozzle that opens in the vicinity of an emitter tip, from which ultrasonic waves from an ultrasonic wave generating means are radiated, filling the space between the aforementioned emitter tip and the inadequately cleaned surface area. Next, ultrasonic waves are emitted from the ultrasonic wave generating means and the ultrasonic vibration breaks down the contamination in the inadequately cleaned surface area. Next, the ultrasonic wave transmitting fluid containing the aforementioned broken-down contaminant is sucked up by a suction nozzle that opens in the vicinity of the aforementioned emitter tip. Consequently, the semiconductor substrate cleaning operation can be vastly simplified since, once the cleanliness inspection

has been performed, only the inadequately cleaned surface areas that have been detected need to be re-inspected.

Brief description of the figures

Figure 1 is a block diagram showing the structure of an application example of this invention, Figure 2 is a drawing showing the structure of the cleaning device chassis 10 in Figure 1, and Figure 3 is a simplified sectional drawing to explain the cleaning operation.

1 ... cleaning device, 3 ... X table, 4 ... X-Y table, 5 ... semiconductor substrate, 6 ... laser light oscillator, 7 ... scattered light detection means, 9 ... X table driver, 10 ... cleaning device chassis, 11 ... X-Y table driver, 13 ... ultrasonic wave oscillator, 15 ... supply nozzle, 16 ... suction nozzle, 17 ... cleaning defect, 19 ... ultrasonic wave transmitting fluid

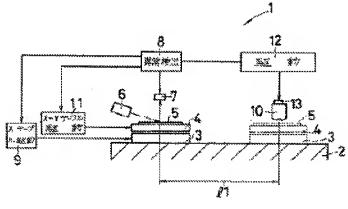

Figure 1

Key: 8 Anomaly sensor

9 X table driver